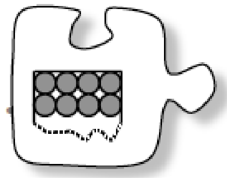
8.3.3 How can I use it?



Circles in Context

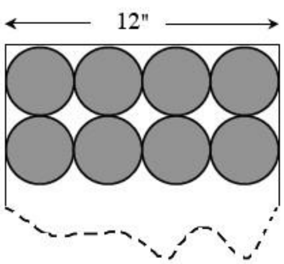
In Lesson 8.3.2, you developed methods to find the area and circumference of a circle with radius *r*. During this lesson, you will work with your team to solve problems from different contexts involving circles and polygons.

8-114. THE GRAZING GOAT

Zoe the goat is tied by a rope to one corner of a 15 meter- by- 25 meter rectangular barn in the middle of a large, grassy field. Over what area of the field can Zoe graze if the rope is:

- 10 meters long?
  20 meters long?
  30 meters long?
- Zoe is happiest when she has at least 400 m^2 to graze. What lengths of rope could be used?

8-115. THE COOKIE CUTTER

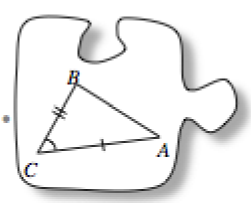


A cookie baker has an automatic mixer that turns out a sheet of dough in the shape of a square 12 inches wide. His cookie cutter cuts 3- inch diameter circular cookies as shown at right. The supervisor complained that too much dough was being wasted and ordered the baker to find out what size cookie would have the least amount of waste.

Your Task:

- Analyze this situation and determine how much cookie dough is "wasted" when 3- inch cookies are cut. Then have each team member find the amount of dough wasted when a cookie of a different diameter is used. Compare your results.
- Write a note to the supervisor explaining your results. Justify your conclusion.

5.3.1 What triangle tools do I still need?

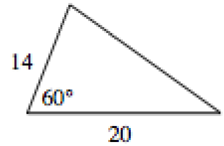


Finding Missing Parts of Triangles

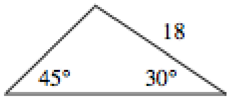
5-74. WHAT IF IT DOES NOT HAVE A RIGHT ANGLE?

If your team needs help on parts (c) and (f) of problem 5- 72, Leila has an idea. She knows that she has some tools to use with right triangles but noticed that some of the triangles in problem 5- 72 are *not* right triangles. Therefore, she thinks it is a good idea to split a triangle into two right triangles.

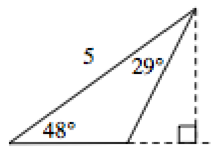
a. Discuss with your team how to change the diagram below so that the triangle is divided into two right triangles. Then use your right triangle tools to solve for the missing sides and angles.

b. 

c. Leila wonders if her method would work for other triangles too. Test her method on the triangle from part (f) of problem 5-62 (also shown below). Does her method work?

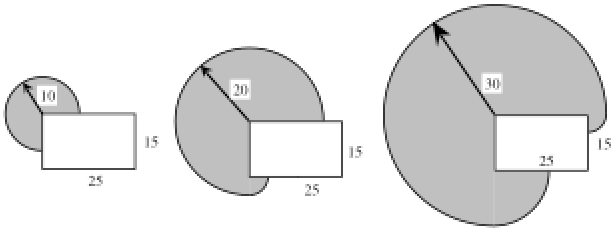
d. 

5-75. Ryan liked Leila's idea so much that he looked for a way to create a right triangle in the triangle from part (g) of problem 5- 72. He decided to draw a height *outside* the triangle, forming a large right triangle. Use the right triangle to help you find the missing side lengths of the original triangle.



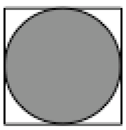
FACILITATOR NOTES/ANSWER KEY

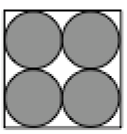
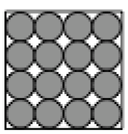
Some students may have trouble visualizing what is going on in problem 8- 114. It is suggested that you have a model prepared for a demonstration. A rectangular box with a string can be used on a chalkboard to help students visualize the various regions. Or, give each team a piece of string and suggest that they use a textbook to represent the barn. If students place the string through the text, they will need to hold the cover firmly as the goat "walks." Encourage them to experiment with various lengths of string.



At right are sample diagrams for the goat's grazing areas.

Problem 8- 115 takes advantage of the fact that as a shape (such as a circle circumscribed by a square) is


enlarged or reduced proportionally, the ratio of the area inside the circle to the area of the square remains constant. For example, if the area of the shaded circle at right is *A* and the area of the circumscribed square is B, then the ratios of the areas is *A : B*. If the circle and square are enlarged or reduced by a factor of *r*, the enlarged area of the shaded circle is Ar^2 and the area of the enlarged square is Br^2. The ratio of the areas is the same since $Ar^2 : Br^2$ is the same as *A : B*.



That helps explain why the amount of "wasted" dough (the area outside the circle but inside the square) is constant, even when the unshaded area seems to be changing.

8-114.

a. ≈ 235.62 m^2
b. ≈ 962.11 m^2
c. ≈ 2316.92 m^2
d. $x \geq 13.03$ meters, or 13 meters

8-115. The diameter of the cookie does not matter. The amount of dough "wasted" will always be $144 - 36\pi$ square inches, assuming that the diameter of each cookie is a factor of 12.

5-74. See below.

a. Missing side = $\sqrt{316}$ units ≈ 17.8 units, missing angles $\approx 43°$ and $77°$
b. Yes; missing sides ≈ 12.7 units and 24.6 units, missing angle = $105°$

5-75. The side opposite the $48°$ angle ≈ 3.81 units while the other side is ≈ 2.5 units long.